



A.D. 1829 N° 5766.

S P E C I F I C A T I O N

OF

JOSEPH RAYNER.

APPARATUS FOR GENERATING AND
CONDUCTING HEAT BY MEANS OF FLUIDS,
APPLICABLE TO CERTAIN MANUFACTURING
PROCESSES.

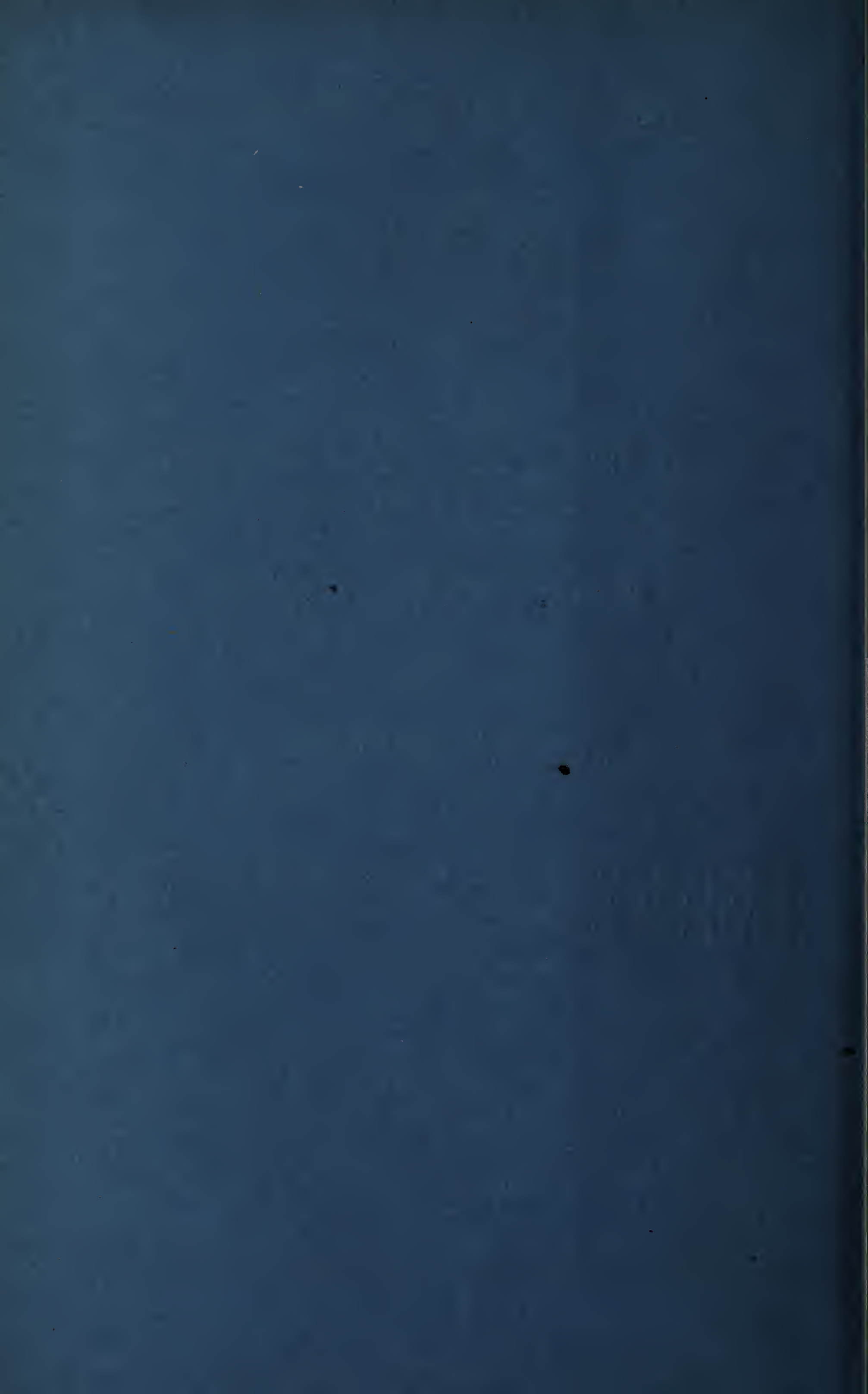
L O N D O N :

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**Apparatus for Generating and Conducting Heat by
means of Fluids, applicable to certain Manufac-
turing Processes.**

RAYNER'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOSEPH RAYNER, of King's Square, in the Parish of Saint Luke, Old Street, in the County of Middlesex, Civil Engineer, send greeting.

WHEREAS His most Excellent Majesty King George the Fourth, by His
5 Letters Patent under the Great Seal of Great Britain, bearing date at West-
minster, the Fifth day of February, in the tenth year of His reign, did, for Him-
self, His heirs and successors, give and grant unto me, the said Joseph Rayner,
His especial licence that I, the said Joseph Rayner, my executors, adminis-
trators, and assigns, or such others as I, the said Joseph Rayner, my executors,
10 administrators, and assigns, should at any time agree with, and no others,
from time to time and at all times during the term of years therein expressed,
should and lawfully might make, use, exercise, and vend, within England,
Wales, and the Town of Berwick-upon-Tweed, my Invention of "**CERTAIN
IMPROVEMENTS IN APPARATUS AND MACHINERY FOR CONDUCTING HEAT, AND APPLYING**
15 **THE SAME IN THE OPERATIONS OF WASHING, SCOURING, CLEANSING, FULLING, DRESSING,**
DYING, AND FINISHING WOOLLEN CLOTHS, AND IN CALENDERING, STRAINING, GLOSSING,
POLISHING, AND FINISHING SILKS, COTTONS, LINENS, WOOLLENS, AND ALL OTHER
GOODS TO WHICH THE SAME MAY BE APPLICABLE;" in which said Letters Patent
there is contained a proviso, obliging me, the said Joseph Rayner, by an instru-
20 ment in writing under my hand and seal, particularly to describe and ascertain
the nature of my said Invention, and in what manner the same is to be
performed, and to cause the same to be inrolled in His Majesty's High Court of

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Chancery within six calendar months next and immediately after the date of the said recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said Joseph Rayner, do hereby declare that the nature of my said Invention, and 5 the manner in which the same is to be performed, is fully described and ascertained as follows (that is to say):—

My improvements consist in the Invention of the application of an apparatus for generating and conducting heat by the circulation of heated fluids to the process of manufacturing of woollen and other cloths, and of polishing 10 and finishing the same, by which certain improvements are effected in the said process; also in the Invention of the application of apparatus and machinery to such other useful purposes as are herein-after described and exhibited in the accompanying Drawings. Figure 1 represents a section of a generator or boiler, which may be constructed of cast or wrought iron, or any suitable 15 material, secured by a safety valve and placed on its end, suspended by parts projecting into the brickwork, as shewn in the Figure. The fire is placed under the end, and the flues are constructed to circulate spirally or otherwise around the generator, which, by passing over a large portion of the surface of the generator, will effect considerable saving in the consumption of fuel. To 20 the generator may also be adapted and connected a pneumatic apparatus, which will effect a more complete combustion of the fuel, and a consequent saving of expence. This pneumatic apparatus may be a pair of bellows of the usual construction, or a cylindric or tubular blowing apparatus, as circumstances may render convenient. The generator is charged quite full of fluid (water being 25 preferable in ordinary cases on account of its cheapness) and heated to the required temperature. Should any loss of the fluid arise from leakage at the joints or otherwise, it is supplied by the cistern *a*. To the projecting flanches or nozzles *b, c*, pipes are connected for conveying the heated fluid. *d, d, d*, represents a safety valve, lever, and weight; *e, e*, a tube or indicator, by which 30 the degree of heat the fluid has obtained may be known; it will also serve as an air tube when the generator is charged with fluid, and will also indicate the quantity of water in the generator. *f, f*, represent the furnace or grate bars; *g, g*, the hoppers, by which the fire is supplied with fuel. To the generator thus described a pipe is attached at the nozzle *b*, which may be conveyed in any 35 direction, and made to communicate with cylinders, the exterior casing of wood vats, or other contrivances, and is connected with a return pipe entering at the nozzle *c*, and which will cause the entire circulation of the heated fluid, which may thus be applied to furnace dying, heating stocks of fulling mills, or any

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similar purpose, which admit of an exterior and interior case being so placed as to permit the hot fluid to act freely upon the object to be heated; and the degree of heat required will be obtained by regulating the degree of heat to which the fluid in the generator, Fig. 1, is carried. I proceed to describe the
 5 method of applying the circulation of heat by fluids to such purposes:—Figure 2 represents an horizontal view of an apparatus for transmitting heat by fluids or liquids for the purpose of heating a drying stove for cloths of any description, or for any other useful purpose where a soft and mild heat is desirable, and in particular where great security from fire is required; for as the heat
 10 may be conducted to almost any reasonable distance, and the generator being placed in a situation of security, at a distance from the drying stove, the risk from fire is reduced to a minimum, or the least possible, under any construction of heating apparatus. *h* represents the top of the generator (as seen at Figure 1), and the heated fluid passes along the pipes *i, i, i, i, &c.*; *j*, the
 15 counter generator, by which the more rapid circulation of the heated particles is secured. The bent pipes present an extended surface, from whence the particles of heat are passing by radiation in rapid succession. The generators in this case are placed as much lower than the stove as circumstances will admit, and the pipes or tubes are laid on a wall or any other solid foundation,
 20 by which they may be firmly supported, and kept in the situation in which they are placed. The same apparatus will apply with advantage to heating buildings or manufactories, under various modifications and construction, adapted to the circumstance of each particular case; but the application to buildings or manufactories I do not claim as any part of my Invention.
 25 Figure 3 represents an application of the apparatus to the purpose of indigo or vat dyeing, by which any number of vats may be heated at one time. The heat is conveyed by the fluid along the pipes and round a casing or interior tube placed in the vat, and the heat may be increased or diminished by turning the stop-cock. *k, k*, represents the generator and counter generator.
 30 *l, l, l, l, &c.* represent the vats in section; *n, n*, the circular tube or casing, within which the hot fluid circulates; *m, m*, the stop-cocks, through which the fluid passes into the casing of the vats; *o, o, o, o*, are the pipes through which the fluid circulates. Figures 4 and 5 represent applications of the apparatus to drying calicoes, prints, and other manufactured articles. *p, p, p, p*, are rollers
 35 on which pieces of calico are alternately rolled; it then passes over the hot cylinders *q, q, q, q*, to the rolled *p, p*, at the other end on which it is rolled by the motion of the shaft *r*, through the medium of a strap or band; and when the piece to be dried is drawn out to the end, the motion of the shaft *r* is reversed by any of the usual modes of changing the motion, and the cloth is

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rolled back on the rollers p, p , at the other end, and this operation is repeated until the piece is sufficiently dry. The cylinders are heated by a generator, and the heat passes through each cylinder in succession, and the fluid or liquid returns by circulation for fresh supplies of heat to the generator. s, s , represents the pipes through which the hot fluid or liquid passes to each cylinder in succession, 5 &c. These apparatus may be made under various arrangements of construction, and Figure 5 is given as another application of the principle for drying piece goods. t^1, t , represents a case charged with heated fluid or liquid, and of sufficient width to dry the extended breadth of the piece; u, u , are nozzles or finches, by which the heat is charged, and returns to the generator; v, v, v , are 10 rollers, on which the cloth may be wrapt alternately; w, w, w, w , are carrier rollers, placed across the heated case, to allow the cloth to pass freely over the surface, and may or may not be used, as the strength or delicacy of the fabric may require. Fig. 6 represents a section of the generator, and its application to heating a cylinder or other form of vessel to be applied to manufacturing 15 purposes, to be hereafter described. The generator A is assumed to be in all cases kept entirely full of the fluid or liquid to be heated, and which is intended to be the medium of transmitting heat to the various purposes to which it is applied. That fluid will in most cases be water, or it may be oil or other liquids, whose boiling points range much higher on the scale of Fahrenheit. 20 The generated A being full of the fluid or liquid to be heated, also the pipes B and the cylinder C, as the process of heating proceeds, the heated fluid or liquid will pass from the top of the generator A along the pipes in the direction of B to C, and, slightly cooling in its progress, the colder particles will pass from and along the pipe D, and will return to the bottom of the generator A at c , 25 by which means a constant circulation of heat through the heated fluid or liquid will be kept up. This is a plain and obvious application and illustration of the principle of conducting heat by fluids or liquids. The pipes B and D may be made of any shape or form that circumstances may require, and the cylinder C may be either stationary, as in Fig. 4, or made to move by 30 wheels and pinions (or other means), as hereafter described in the Figs. 7, 8, 9, and 10. A steam-tight and packed joint is described at E, E, in Fig. 6, by which it is obvious that the cylinder C may be put in motion while the pipes B and D remain stationary. The construction of the packed joints are so distinctly represented by the Drawing at E, E, that any competent machinest 35 may construct the same without further description. This application of the principle of conducting heat by fluids will apply to the calender with beneficial effect, and any required degree of heat may be had on the surface of the calendar roller with convenience. The apparatus described in Fig. 6 will

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apply with little modification to calendering, and may be advantageously adapted to any of the machine calenders in common use, which will greatly assist in straining, polishing, glazing, and finishing cottons, silks, linens, woollen, or other piece goods requiring this process. By an apparatus similar
5 to Figured 6, and an adaptation of the needful pipes, heat may be applied in the woollen manufacturies to the process of washing and scouring, and cylinders or vessels of wood or iron may be heated to the required temperature. The stewing process may be performed by an adaptation of the apparatus in Fig. 6 by the same apparatus adapted to the object. Heat may be applied to the
10 fulling mill, using a case or lining instead of a cylinder, and the heating of furnaces for dyeing effected in the same way. The same apparatus (Fig. 6) will also apply to the generating of heat for the vats and furnaces of manufacturing chymists and bleachers. The peculiar arrangement required for such objects will arise out of the circumstances of each particular case of application,
15 preserving and adhering to the principle of entire circulation of the heated fluid or liquid, as illustrated in Fig. 6. A drying stove upon the plan suggested in Fig. 3, and heated by the generator as described in Fig. 1, will apply to gunpowder and all other manufactures where security and risk from accident by fire is the primary consideration.

20 Fig. 7 and 8 represents the two sides of a machine for brushing, pressing, and finishing woollen cloths. 1, 1, 1, 1, is the cast-iron frame on which the machine is mounted, and 2 is a shaft placed across the entire machine, and to which is fixed a fast and idle pulley, or any other apparatus by which the machine may be put in motion. 3 is a pinion on the shaft 2, working into and
25 moving the wheel 4 on the end of the heated cylinder C. 5, 5, are wheels on the end of the roller shafts 6, 6, and which are put in motion by the wheel 4 on the axis of the heated cylinder C; the rollers 6 move the rollers 7, 7, 7, 7, by friction or pressure. F represents an iron roller smoothly turned to press upon the surface of the heated cylinder C. The cylinder C may be made of
30 cast iron or other suitable material, and the rollers 7, 7, &c., &c., may be made of wood or iron constructed in the usual way. 8 is a wheel on the central shaft 2, which works into and moves the wheels 9, 9, on the ends of the brushes H, H, with considerable velocity. 10, 10, are levers, from which is suspended a weight to press the rollers 7, 7, on 6, by which the cloth is firmly held during
35 the operation of brushing, &c., &c. 11, 11, are screws, to press the roller F on the cylinder, and by which the operation of pressing is performed at the same time with that of brushing. 12, 12, represents three smooth iron rollers, by which the cloth is strained and held tight in passing to the friction rollers 7, 7, and 6. 13, 13, represents a circular lining or case of wood, to be placed so as

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to receive the cloth as it descends from the friction rollers 7, 7, 6, and it is made smooth in the inside, so that the cloth may receive no injury as it passes during the operation. The operative parts of this machine being thus described, it may be lawful to state that the cloth to be acted upon is placed in the circular lining or case 13, 13, and passes over and under the rollers 5 12, 12, in the direction shewn in the Drawing, over the friction rollers 7, 7, to the brush H; then to the heated cylinder C, over which it passes, under the roller F, then descends in the same way over the other brush H to the friction rollers and the wood case 13; the operation is carried on successively until completed. Heat is applied to the cylinder C by the apparatus 10 described in Fig. 6; and the surface of the heated cylinder may be raised to the desired temperature, and being uniformly by the roller F through its entire length, the process of hot pressing, brushing, and polishing or finishing is thus performed at the same time and by one operation. Steam or hot water may be applied during the operation to the surface of the cloth, by which the cloth 15 is polished, and a superior lustre is raised on the surface. The heated cylinder may be moved with more or less velocity, at the option of the user, or as experience shall suggest, and the same remark will apply to the brushing cylinder. The above proportions are such as may be applied to advantage. Figs. 9 and 10 represent the two side views of a machine, being another 20 application of the heating apparatus to dressing and cleansing or moistening woollen and other cloths. 15, 15, 15, represents the cast iron or wood frame on which the machinery is mounted. 16 is a pinion on the axis L, extending across the centre of the machine, and having placed or fixed on the end of the same internal and external friction wheels, or a fast and idle pulley, by which 25 motion is communicated to the entire machine. The pinion 16 takes into and moves the wheel 17, fixed on the heated cylinder M. N is a roller of wrought or cast iron, of the same length as the heated cylinder, and both are smoothly turned on the surface. The axis of the heated cylinder is fitted with flanches, which are adapted to join the pipes at the steam-packed joints, as shewn at 30 E, E, Figure 6, by which means the cylinder is heated to the required temperature. 18 is also a wheel on the axis O, acted upon and moved by the pinion 16. 19, 19, are wheels, acted upon and moved by the wheel 18, which give motion to the cloth rollers 20, 20, on which axis they are placed, so as to move freely and independantly when out of gear. On the axis of the cloth 35 rollers 20, 20, ratchet coupling wheel are placed, which by teeth take into corresponding teeth on the side of the axis of the wheels 20, 20. These ratchet wheels are moved in and out of gear alternately as the cloth passes during the operation from one to the other roll, the change being effected when the cloth

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has reached the extremity of its length. 21 is a lever, moving on a centre 22, by which the wheels are thrown in and out of gear, or remain neuter, at the option of the operator, and as circumstances may require. 23, 23, are brushes of wire or of bristles, or any other suitable material; or one or both
5 may be formed after the usual construction of the gig mill cylinder, with boards, to receive the teazles or wires of any peculiar make or adaptation, to the purposes of dressing cloth, and these may be moved with the required velocity by changing the wheel 28. 24, 24, are friction wheels, fixed on the ends of the axis of the cloth rollers 20, 20. 25, 25, are levers, to which a weight is
10 attached, and by which the friction wheel is retarded in its motion and held steady when the wheel 19 is out of gear. The levers 25, 25, are joined to the large lever 26 by chains at each end, and as the ends of the lever 26 rise and fall, the levers 25, 25, will alternately act upon the friction wheels 24, 24, and at the same time the depression or elevation of the lever 26 will operate upon the
15 lever 21, and throw it in or out of gear, as the case may require; and this is effected by alternate cams fixed on an upright bar. 28 is a wheel on the end of the axis L, and operates upon and moves the wheels at the ends of the axis P, P, on which the brushes of wire or bristles of the gig mill cylinder is firmly attached and fixed, and which is moved with the requisite velocity. 30, 30, are
20 friction rollers, to give greater or less action of the teazles or wires upon the cloth. 31, 31, are screws, to give pressure to the roller N, if required. Another arrangement of machinery may here be described, and heat be applied to the cloth during the operation of dressing or raising the pile, by which the action of the teazles, brushes, or wire in the gig mill, will be greatly assisted, and
25 a double gig will be formed. In morseing or cleansing woollen cloth, the successive charges of water will be assisted by the application of heat, which may be raised to any required temperature. 32, 32, Fig. 9, represents the exterior ring of a gig mill. 33, 33, are the boards of the gig mill, on which the teazles or wires rest, and are supported between these boards. A roller
30 34, 34, of copper or any other suitable material, may be inserted, of about 3 or 4 inches diameter, more or less, which, being suspended on their own axes, will move by the pressure of the cloth on the gig mill; or in the space between the boards may be inserted a convex tube or case of copper, fixed to and on the ring of the gig mill, as seen at 35, 35, Fig. 9. These rollers or tubes may be
35 heated as follows, viz^t, at the axes of the gig cylinders P, through a steam-packed joint, connecting with a case of copper or cast iron. This case has a hollow space of about two inches, and is of sufficient diameter to extend to and support the copper rollers by their axes, which are inserted in the side of the case through a stuffing box or other packing to prevent leakage. The hot

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fluid being charged at the axis P, through a steam-packed joint from a generator, as described at Fig. 6, the hollow case on the axis will communicate the heated fluid to the copper rollers or tubes, which will pass through the hollow axis of the rollers or tubes along the entire width of the gig mill, and descend by a similar case at the other end of the axis, and will pass through a steam-packed joint and return to the generator, as shewn at Fig. 6. Thus heat may be applied to the gig mill in common use, and two, four, or more heated rollers may be applied during the operation of dressing cloth, at the same time the teazles or wires are performing their operation. The operation is by folding or winding the cloth on the cloth roller 20, passing it in the direction shewn in the Drawing *g* over the gig mill cylinder or brush or the heated cylinder, then forward to the other brush or gig mill to the cloth roller 20; and when the cloth has run through its entire length, it returns back to the other cloth roller, as heretofore described, and the operation is repeated until complete.

15

In the apparatus and machinery before described, I claim solely as the subject of my Invention, the application of heat conducted by a circulating fluid or liquid through an apparatus of any construction to the several useful purposes herein-before stated, whatever may be the fluid or liquid used or the particular form or combination of machinery employed for effecting such purposes; but I do not claim any of the parts of such apparatus or machinery; fluids or liquids form a more convenient medium for conducting heat than any other means. I therefore claim as my Invention solely, the application of heat conducted by a circulating fluid or liquid to the manufacture of woollen and other cloths, and also the other objects contemplated under any modification of construction calculated for the general application of the principle of circulation, as stated at Figure 6. This form of construction will admit of considerable variation, but the principle on which the Invention is founded, as above said, is that of causing the heated fluid to circulate freely, and as it cools in its progress to return to the generator for fresh supplies of heat, which operation would continue until the whole fluid is of equal temperature, but which can never be the case so long as the heat is passing, by radiating from the surfaces intended to communicate heat to the useful objects and purposes herein-before stated.

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In witness whereof, I, the said Joseph Rayner, have hereunto set my hand and seal, this Fifth day of August, in the year of our Lord One thousand eight hundred and twenty-nine.

JOSEPH (L.S.) RAYNER.

The diagram shows a closed-loop system with two circular reservoirs, labeled h and j , connected by a network of pipes. The pipes are arranged in a grid-like pattern with multiple U-shaped turns. Arrows indicate the direction of flow throughout the system.

A detailed technical drawing of a ship's hull cross-section. The hull is elongated with rounded ends. Internal structural elements include two vertical bulkheads and a central longitudinal keel. Flow lines, represented by arrows, show the movement of water or air around the hull's exterior and through internal passages. Various points are labeled with letters: 'u' at the bow and stern, 'w' at the top and bottom edges, and 't' for the internal longitudinal structure. The drawing is a monochrome line illustration.

This technical drawing illustrates a complex mechanical system, likely a steam engine or a similar industrial machine. The central component is a large wheel with a cross-shaped frame, labeled 'R'. This wheel is connected to a central shaft or axle, which is supported by a frame. The system includes three large wheels at the bottom, each with a cross-shaped frame, labeled 'P', 'Q', and 'S'. These wheels are connected to a central shaft or axle, which is supported by a frame. The drawing also shows various gears, levers, and other mechanical components, all labeled with letters and numbers. The overall design is symmetrical and detailed, showing the intricate mechanics of the system.

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AND BE IT REMEMBERED, that on the Fifth day of August, in the tenth year of the reign of His Majesty King George the Fourth, the said Joseph Rayner came before our said Lord the King in His Chancery, and acknowledged the instrument aforesaid, and all and every thing therein 5 contained and specified, in form above written. And also the instrument aforesaid was stamped according to the tenor of the Statute made in the fifty-fifth year of the reign of His late Majesty King George the Third.

Inrolled the Fifth day of August, One thousand eight hundred and twenty-nine.

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Printers to the Queen's most Excellent Majesty. 1854.

